

#### REMARKS

Claims 50-72, 85-90, 98-110, 112-123, and 126-159 are pending. Claims 50-72 and 85-90 are withdrawn from consideration. Claims 98, 104, 105, 106, 108, 126, 127, 128, 148, and 152 are in independent form.

All pending claims stand rejected under 35 U.S.C. § 103(a) as obvious over Gibson in view of Barisci (Trends in Polymer Science, 1996) and Casella, Thackeray, Yamato, Naarmann, Li, Sakaguchi, Stetter (U.S. 5,512,882) or Wampler and Breheret, Mifsud I, Mifsud II, Moy or Persaud. Further, page 4, 2<sup>nd</sup> para. of the Office action mailed April 20, 2004 appears to contend that de Lacy Costello is material to the patentability of pending claims, whereas page 2, para. 2 of the action fails to mention de Lacy Costello. To advance prosecution, de Lacy Costello is addressed at this time.

From Applicants' reading of the action, it appears that the gist of the rejection contends, in light of Gibson allegedly describing a conductimetric sensor system that senses analytes by measuring the electrical conductance through a conducting polymer film, that:

- 1) at least one of the remaining references describes a sensing area that provides an electrical path through the regions of the conductive organic material and the regions of the compositionally different conductive material; and

- 2) the application of any such sensing area to Gibson's conductimetric sensor system would be obvious to one of ordinary skill in the art.

Applicants disagree with both of these contentions. Rather, Applicants submit that none of the remaining references describes or suggests a sensing area that provides an electrical path through the regions of the conductive organic material and the regions of the compositionally different conductive material, and that the application of the materials described by the remaining references to Gibson's conductimetric sensor system would not have been obvious to one of ordinary skill.

**I: None of the Cited References Describes or Suggests a Sensing Area that Provides an Electrical Path through a Conductive Organic Material and a Compositionally Different Conductive Material.**

With the exception of independent claim 127, each and every pending independent claim recites a "sensing area". The sensing area generally provides an electrical path through a conductive organic material and a conductive material compositionally different than the conductive organic material. In claim 152, the sensor response varies according to the presence of an analyte in contact with the electrical path through the sensing area. In claims 98, 104, 105, 106, 126, an apparatus detects a change in the sensing area.

Applicants respectfully submit that, even if the cited references were to describe or suggest a composite of a conductive organic material and a conductive material compositionally different than the conductive organic material (which they do not), if any such composite were used as an electrode in wet-cell, amperometric sensors, such a composite would not be a "sensing area" as recited in Applicants' claims.

Amperometric sensors operate by measuring the flow of charge (i.e., the current) across the electrode/solution interface. As described at the last paragraph on pg 307 of Barisci, the rate of charge transfer across the electrode/solution interface is determined by a number of factors including the capacitance between the electrode and the solution and the availability of electronic states at the electrode surface that can participate in charge transfer with species in solution.

Since amperometric sensors rely upon measurement of the rate of charge transfer across the electrode/solution interface to identify species in solution, the "sensing area" of an amperometric sensor is the electrode/solution interface itself. Although the composition of the electrode impacts charge transfer across the interface (e.g., by determining which electronic states are present at the interface), the electrode itself is not part of the sensing area.

Indeed, for an amperometric sensor to operate properly, the body of the electrode must generally be "invisible" to the sensing device. In amperometric sensors, the body of the electrode is in electrical series with the electrode/solution interface. In other words, a charge will flow both through the body of the electrode and across the electrode/solution interface. If the resistance of the body of the electrode is comparable to the resistance of the electrode/solution interface, then charge flow will be limited by both the body of the electrode and at the electrode/solution interface. If the resistance of the body of the electrode is higher, charge flow will essentially be limited by the body of the electrode alone.

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In these situations (i.e., when the resistance of the body of the electrode is "sensed"), amperometric sensors will not function as intended. In particular, the measurements made by the amperometric sensor will not reflect charge transfer across the electrode/solution interface. Rather, the measurements will reflect the electrical conduction of the body of the electrode. Such a "sensing" of the electrode body by the current sensor would thus render the electrode body unfit for its intended purpose in the amperometric sensor.

Applicants therefore respectfully submit that composites of conductive polymer films and conductive materials compositionally different than the films used as electrodes in wet-cell, amperometric sensors are not "sensing areas" as claimed. Moreover, Applicants submit that usage of such composites as sensing areas would render the composites unfit for their intended purpose in amperometric sensors, namely to provide low-resistance conductors that provide certain electronic states to the sensing electrode/solution interface.

**II: The Application of the Conducting Polymer Films in the Cited Art to Gibson's Conductimetric Sensor System would not be Obvious to One of Ordinary Skill in the Art.**

Page 11, 1<sup>st</sup> full paragraph of the outstanding Office Action contends that one of skill in the art would have looked to electrochemical sensors for improvements in chemoresistive sensors. Page 3, 1<sup>st</sup> full paragraph contends that Barisci describes a connection between amperometric (i.e., "current measuring techniques") and conductimetric techniques that would have been recognized by one of ordinary skill. The basis for

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this connection is said to be Barisci describing analytes interacting with conductive polymers to modify current flow as a function of applied potential. The current measuring section of Barisci pointing to the conductometric/resistometric section as one way that the current flow can be modified through interaction of an analyte and the conducting polymer, and the conclusion that it is clear from both sections that the current flow can be affected by the interaction of the analyte with the polymer or its counter ion.

Applicants respectfully disagree with these contentions and further submit that Barisci provides further support for Applicants' contention that the application of amperometric electrode materials to conductimetric sensors would not be obvious to one of ordinary skill.

As discussed above, in amperometric sensors, the resistance of the electrode body is preferably not sensed at all. Rather, charge flow across the electrode/solution interface is sensed. While the resistance of the electrode body is determined by the composition and arrangement of the electrode body, charge flow across the electrode/solution interface is determined by a variety of other factors, including the capacitance between the electrode and the solution and the availability of electronic states at the electrode surface that can participate in charge transfer with species in the solution.

Barisci acknowledges the distinction between amperometric sensors and conductimetric sensors throughout his paper. The portion of Barisci devoted to amperometric sensors describes reduction/oxidation reactions involving solvated ions and electron-transfer reactions for determining the presence of

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metal ions or small organics molecules. On the other hand, the portion of Barisci devoted to conductimetric sensors describes resistance changes in the polymer itself.

In Barisci, the distinction between amperometric sensors and conductimetric sensors is also explicitly acknowledged when Barisci describes the impact of counterions from the analyte on the different types of sensors. In discussing amperometric sensors, Barisci describes that the oxidation or reduction of the polymer backbone is influenced by certain counterion  $A^-$  from the analyte. As illustrated in FIG. 3 of Barisci, a counterion  $A^-$  can transfer across the electrode/solution interface to bind with cationic polypyrrole. It is this current flow across the electrode/solution interface that is sensed in Barisci's amperometric sensors.

On the other hand, when Barisci describes conductimetric sensors, Barisci indicates that the resistance of the polymer is impacted by the exchange of counterions with those in solution. In such ion exchanges, there is no net current flow across the electrode/solution interface. Rather, a first anion (e.g.,  $A^-$ ) simply exchanges with a second anion (e.g.,  $B^-$ ). Depending upon the relative properties of the exchanged counterions (such as, e.g., the relative electronegativity and electronic states), the conductivity of the polymer itself may change. It is this conductivity change that is detected in Barisci's conductimetric sensors.

In light of this distinction between Barisci's amperometric sensors and Barisci's conductimetric sensors, Applicants respectfully submit that one of ordinary skill would not have looked to materials used in amperometric sensors to improve

conductimetric sensors. There is simply no reason to believe that the conductivity of a material will, in any way, somehow be related to the transfer of charge at the interface of the material with a solution.

Further, the materials chosen to act as electrodes in amperometric sensors are selected based at least in part on the fact that their conductivity is not "sensed" in the amperometric sensor. This "invisibility" is inapposite to application in the sensing area of a conductimetric sensor. Indeed, "sensing" the conductive properties of amperometric sensor electrodes will generally render the electrodes unfit for their intended use in amperometric sensors. Furthermore, it is not the case at all that materials that are good electrochemical detectors will make good chemiresistors so obviousness does not flow from one to the other. An example of this is the use of ferrousine modified enzymatic sensors to detect glucose. These are good electrochemical sensors but make completely useless chemiresistors because in fact they are electronically resistive to DC current in both forms. Thus one of skill in the art would not look to electrochemical sensors as chemiresistors even if they function well for the intended electrochemical sensing purpose.

Applicants therefore respectfully submit that there is no suggestion or motivation to combine the cited references in the manner suggested that is founded in the cited references.

The present response hereby incorporates the response filed January 23, 2004 by reference and does not concede any issues raised in that response.

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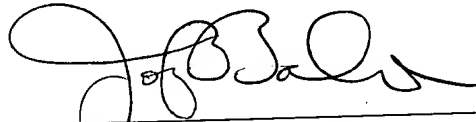
The present response makes no amendments to the claims. In light thereof, entry and consideration of the present response is respectfully requested to advance prosecution.

Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: \_\_\_\_\_

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